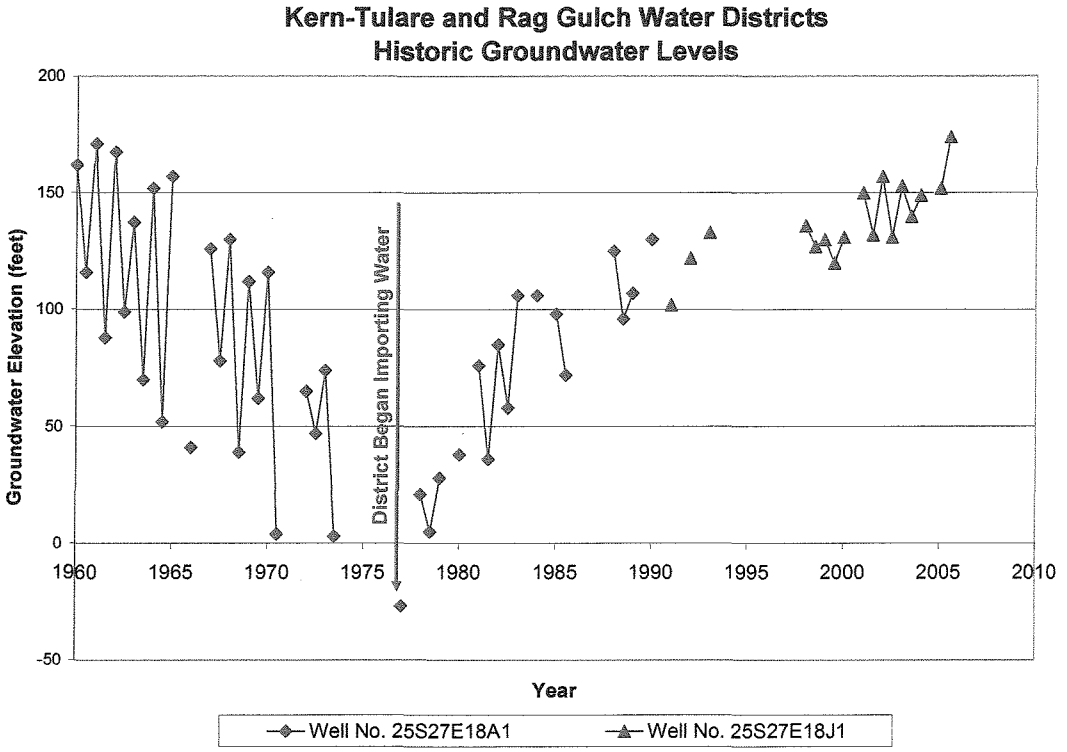
KERN-TULARE WATER DISTRICT

RAG GULCH WATER DISTRICT

GROUNDWATER MANAGEMENT PLAN



June 20, 2006

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INTRODUCTION

This Groundwater Management Plan (Plan) is developed by the Kern-Tulare Water District and the Rag Gulch Water District (the Districts) in accordance with Part 2.75 (commencing with Section 10750) of Division 6 of the Water Code. The purpose of this Plan is to formalize existing groundwater management programs and assist with identification and implementation of modifications to these programs that will preserve and enhance the Districts' groundwater resource.

The procedure for adoption of a groundwater management plan includes the following:

- Hold a public hearing prior to adopting a resolution of intention to prepare a groundwater management plan (Water Code, §10753.2.)1
- Publish the resolution of intention to adopt a groundwater management plan. (§10753.3.)
- Prepare a groundwater management plan within two years of the date of the adoption of the resolution of intention. (§10753.4(a).)
- Provide a written statement to the public describing the manner in which interested parties would be allowed to participate in developing the plan. (§10753.4(b).)
- Hold a second public hearing to determine whether to adopt the plan. (§10753.5.)
- Submit a copy of the plan to the State of California Department of Water Resources (DWR) in electronic format. (§10753.7.)
- Adopt rules and regulations to implement and enforce the plan. (§10753.9.1.) These rules must consider the potential impact of those rules and regulations on business activities. (§10753.10.)

For the purposes of qualifying a groundwater management plan under section 10753.7, the plan must have the following components:

- Develop Basin management objectives for the groundwater basin.

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1 All Statutory citations are to the Water Code unless otherwise indicated.

- Provide for monitoring and management of
  - groundwater levels
  - groundwater quality
  - inelastic land subsidence
  - Changes in surface water flow and quality that directly affect the groundwater levels or quality or are caused by groundwater pumping.
- Develop a plan to involve other agencies that enables the Districts to work cooperatively with other public entities who overly the groundwater basin.
- Prepare a map that details the area of the groundwater basin defined in DWR Bulletin No. 118, the boundaries of the Districts, and the boundaries of other agencies that overlie the basin.
- Adopt monitoring protocols designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence, groundwater pumping, and changes in surface water and quality that directly affect the groundwater levels or quality or are caused by groundwater pumping.

DESCRIPTION OF DISTRICTS

Kern-Tulare Water District was formed on March 5, 1974, and Rag Gulch Water District was formed on January 24, 1955, both for the purpose of providing surface water. The Districts encompasses 23,069 acres and are located on the eastern side of the San Joaquin Valley in Kern and Tulare Counties, approximately 8 miles east of Delano and 27 miles north of Bakersfield. The Districts are located in groundwater basins 5-22.13 and 5-22.14 as shown in Figure 1.

17,200 acres of the 23,069 acres are irrigated. The Districts provide no domestic or residential water supplies. At the present time, all irrigated lands are planted to high-value permanent crops. A summary of land use in 2005 is presented in the Table 1 below.

Table 1

2005 Land Use (acres)			
	Kern-Tulare	Rag Gulch	Total
Almonds	702	133	835
Apples	5	0	5
Blue Berries	0	89	89
Cherries	98	0	98
Grapes	3,626	3,271	6,897
Grapefruit	10	0	10
Kiwi	201	0	201
Lemons	125	0	125
Olives	204	0	204
Oranges	5,913	885	6,798
Persimmons	17	0	17
Pistachios	1,626	270	1,896
Pomegranates	25	0	25
Total Irrigated	12,552	4,648	17,200
Non-irrigated	4,563	1,306	5,869
Total	17,115	5,954	23,069

The Districts share a common distribution system and staff. A map of the Districts' facilities is presented in Figure 2.

Groundwater Basins in California

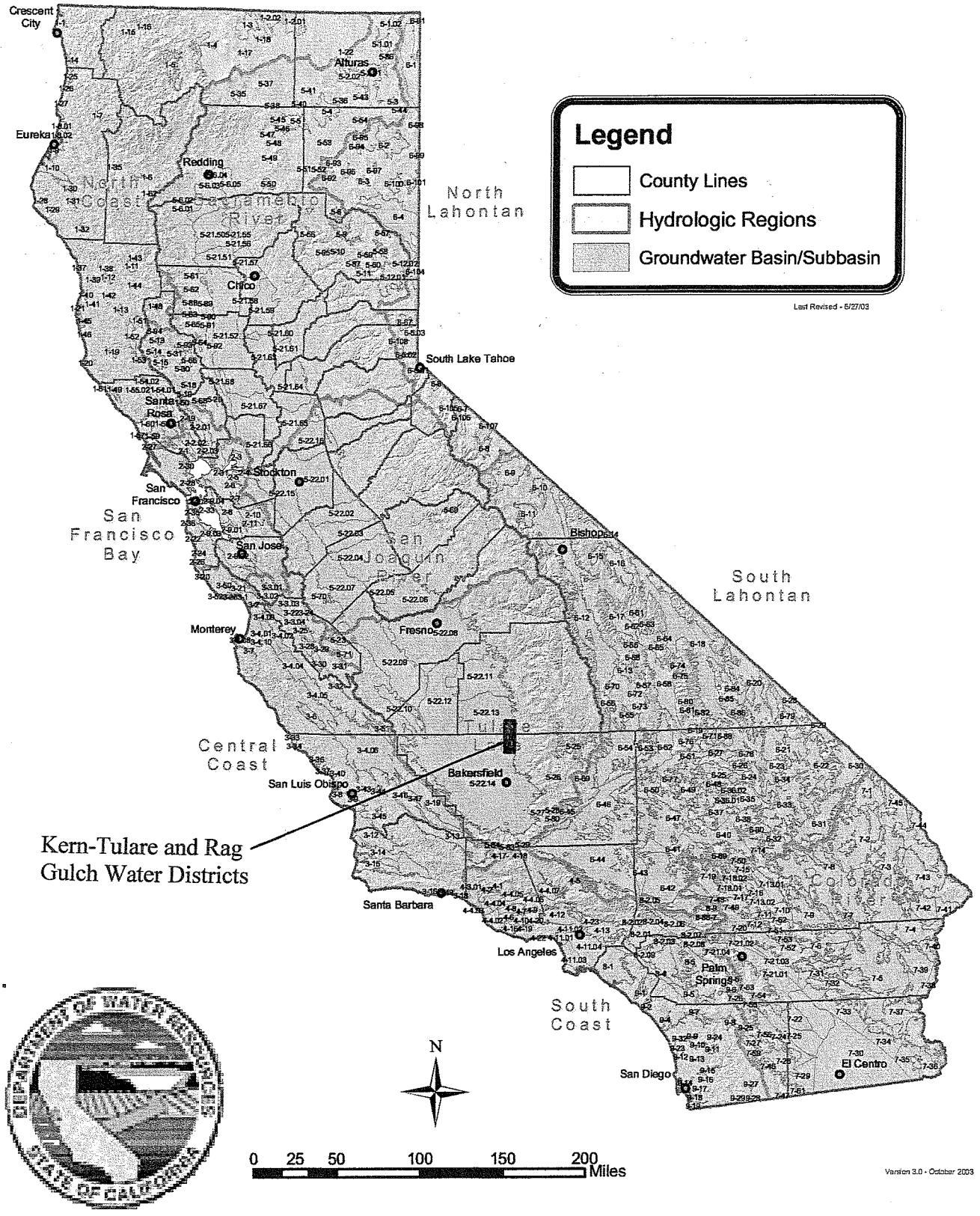
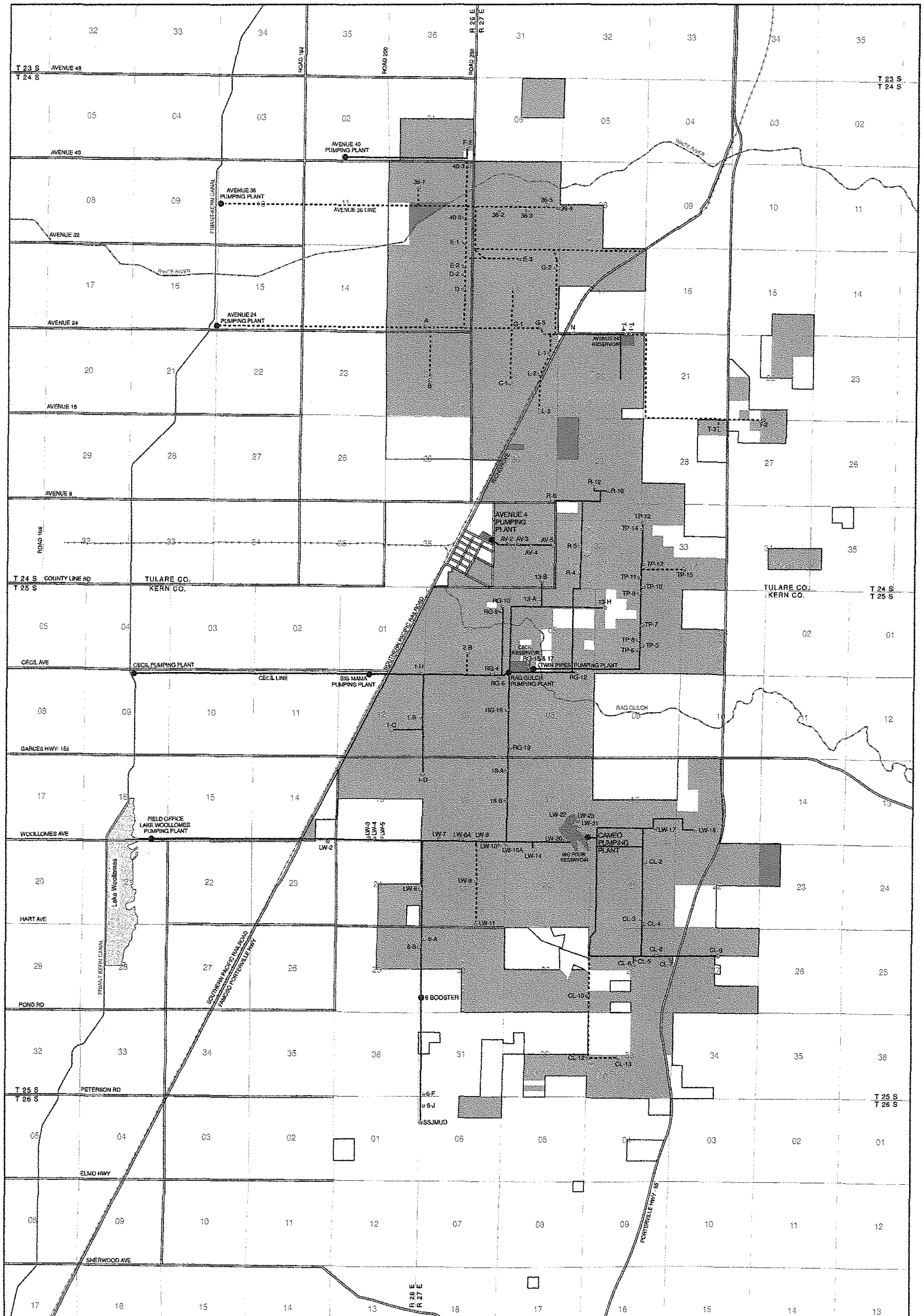


Figure 1



KERN-TULARE WATER DISTRICT

DISTRIBUTION FACILITIES AND SERVICE AREA

APRIL 2010

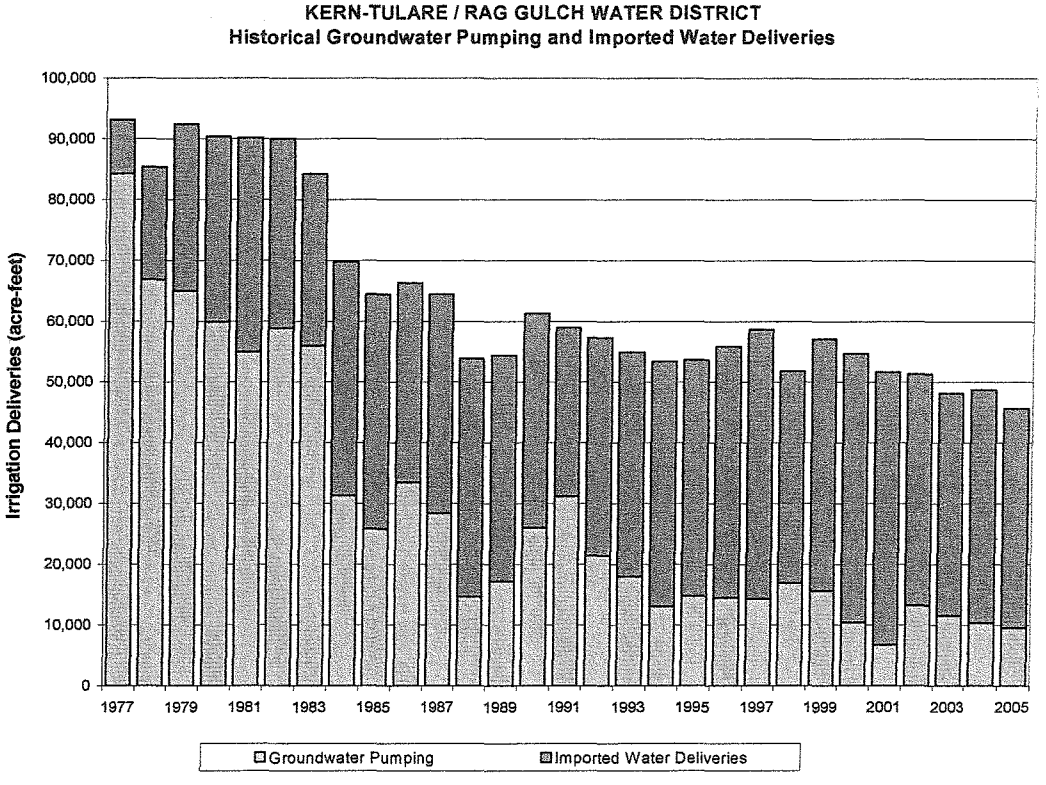
Legend

- District Pumping Plant
- Farm Turnout
- District Pipeline
- Private Pipeline
- Paved Road
- Service Areas
- Non-Service Areas
- Exempt
- Reservoir

The Districts' facilities consist of 12 pumping plants, approximately 65 miles of pressure pipeline, and 4 reservoirs to deliver water upslope from the Friant-Kern Canal. The Districts' distribution system is inadequate to fully satisfy irrigation demands within the service area. As a result, irrigation deliveries are prorated during the summer months and water users rely upon privately owned wells, even in years of ample surface water supply.

Figure 3 illustrates the portion of irrigation demands satisfied with imported water and that portion satisfied with groundwater pumping over the past 29 years. The irrigation demand has continually decreased and the imported water deliveries have increased slightly over time. The decrease in irrigation demand is due to improved irrigation methods and lands being taken out of production. The increase in imported water deliveries is due to distribution system improvements that have lead to reduced groundwater pumping.

Figure 3



GEOLOGIC SETTING

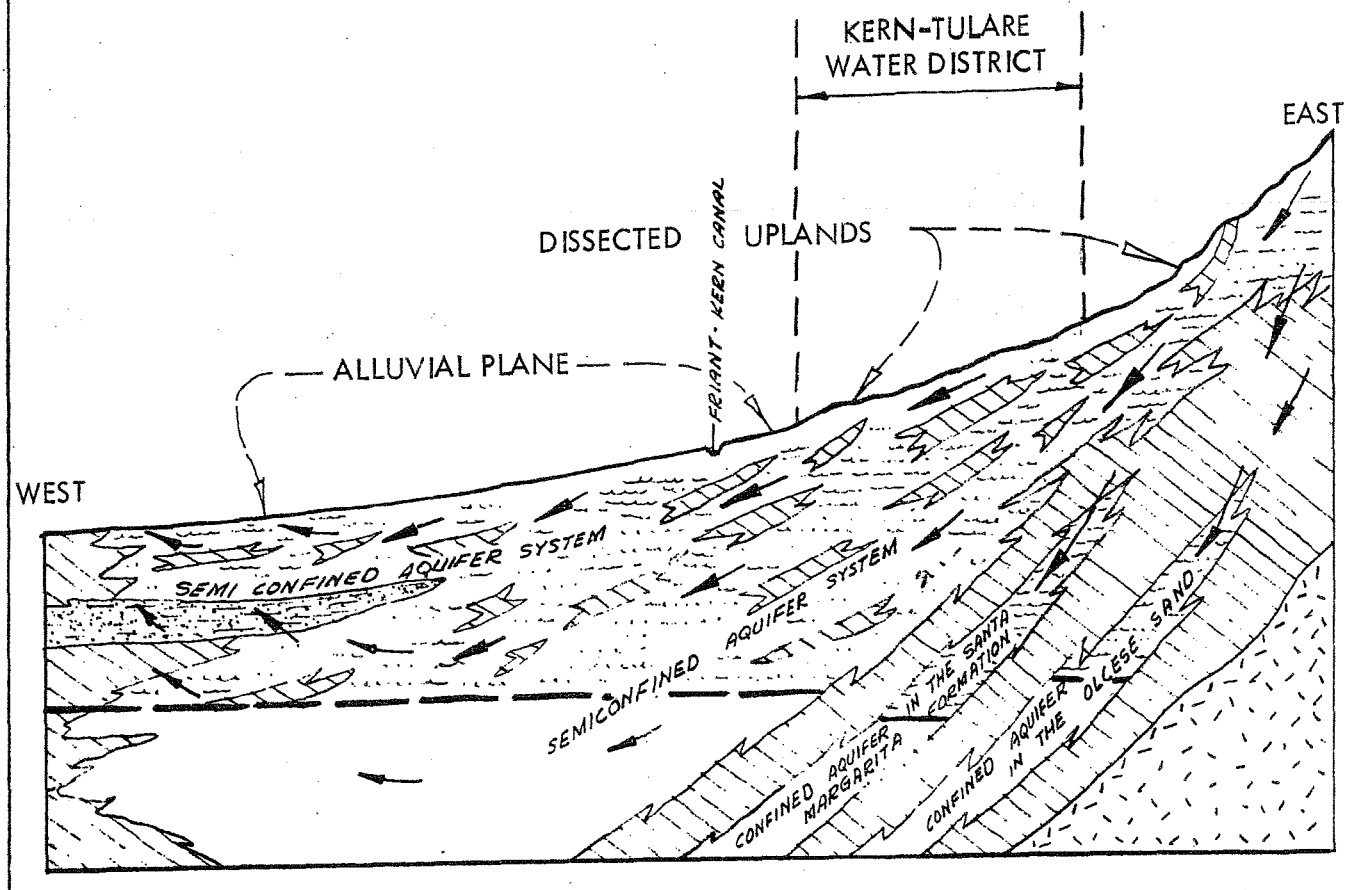
Figure 4 provides a generalized subsurface cross section extending from west to east through the Districts. The geological sequences of permeable, water-bearing sediments within the Districts, from youngest to oldest, are: 1) continental deposits, 2) the Santa Margarita formation, and 3) the Olcese sand.

Wells drilled on the west side of the Districts tap into the continental deposits. Continental deposits comprise an unconfined aquifer and are the most commonly tapped aquifer in the region. The top of this aquifer is the water table and the bottom is the base of freshwater, which is believed to occur at a depth of 2,000 feet.

Wells drilled on the east side of the Districts tap into the confined aquifers of the Santa Margarita formation and Olcese sand deposits. The Santa Margarita formation begins from 1,000 to 1,700 feet below the surface, ranging in thickness from 150 to 200 feet. Underlying the Santa Margarita formation by about 150 to 200 feet is the Olcese sand aquifer, ranging in thickness from 300 to 450 feet.

The Santa Margarita formation and the Olcese sand deposits are shallow to the east and deepen to the west. These deposits contain useable groundwater and are located beneath fine-grained deposits that limit the natural recharge from the land surface. In the easterly parts of the Districts, a number of wells drilled to depths of 1,400 to 2,500 feet tap highly permeable deposits of the Santa Margarita and/or the Olcese Formations. These formations are considered to be a separate aquifer from the continental deposits. Fresh groundwater is present in some areas of the Santa Margarita formation and the Olcese sand deposits to depths exceeding 3,000 feet.

Two nearly vertical subparallel faults (Hodgeman Ranch Fault and Primier Fault) transect the Districts from north to south. Based upon review of groundwater level and quality information, faulting in the area appears to have little or no impact upon groundwater conditions.



DIAGRAMMATIC SECTION SHOWING THE GROUND WATER RESERVOIR

LEGEND

- Low permeability deposits
- Water-yielding deposits
- Corcoran Clay Member of the Tulare Formation
- Basement Complex
- Direction of ground water flow
- Base of fresh water

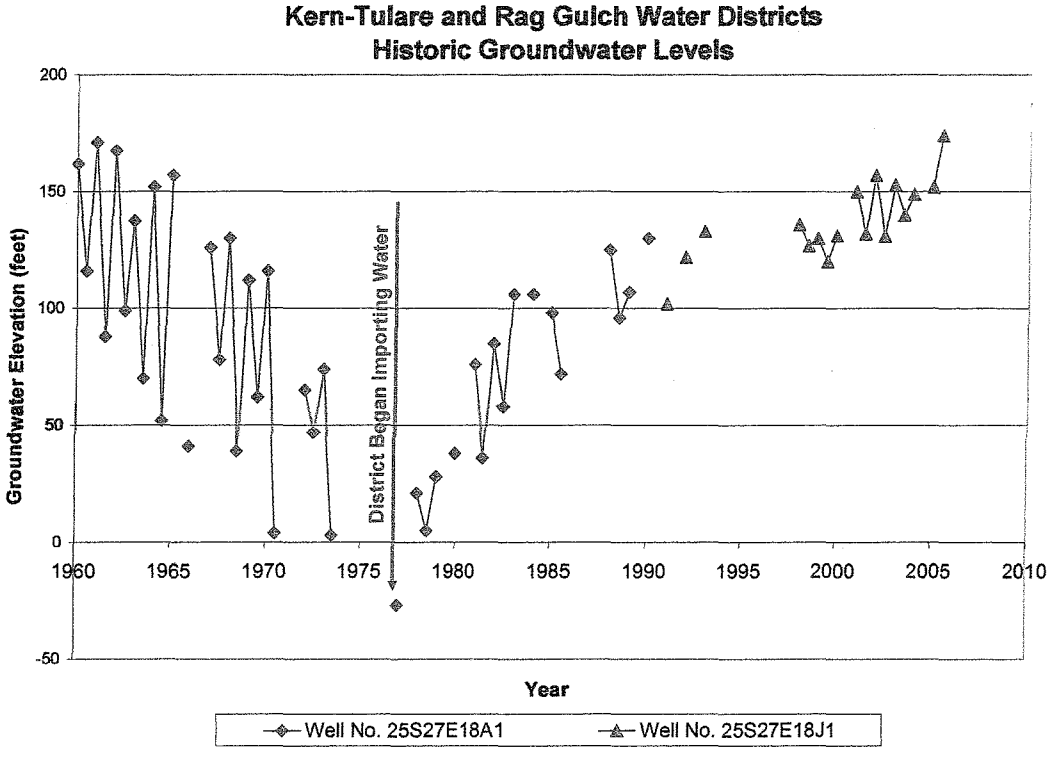
SECTION - GROUND WATER RESERVOIR

Figure 4

OCCURRENCE AND MOVEMENT OF GROUNDWATER

A hydrograph of groundwater elevations from 1960 to date is presented in Figure 5. This hydrograph is located near the center of the Districts and is representative in changes in groundwater levels throughout the Districts. Groundwater levels within the Districts were falling at a rate of approximately 10 feet per year prior to 1977. As a result of these declining groundwater levels, groundwater quality was degrading and subsidence of the land surface was occurring. Groundwater conditions have steadily and dramatically improved since 1977 as a result of the Districts' importation of irrigation water into the area.

Figure 5



Elevations of groundwater levels within the Districts for spring 2000 are presented in Figure 6. Groundwater flows from both the east and west into the Districts.

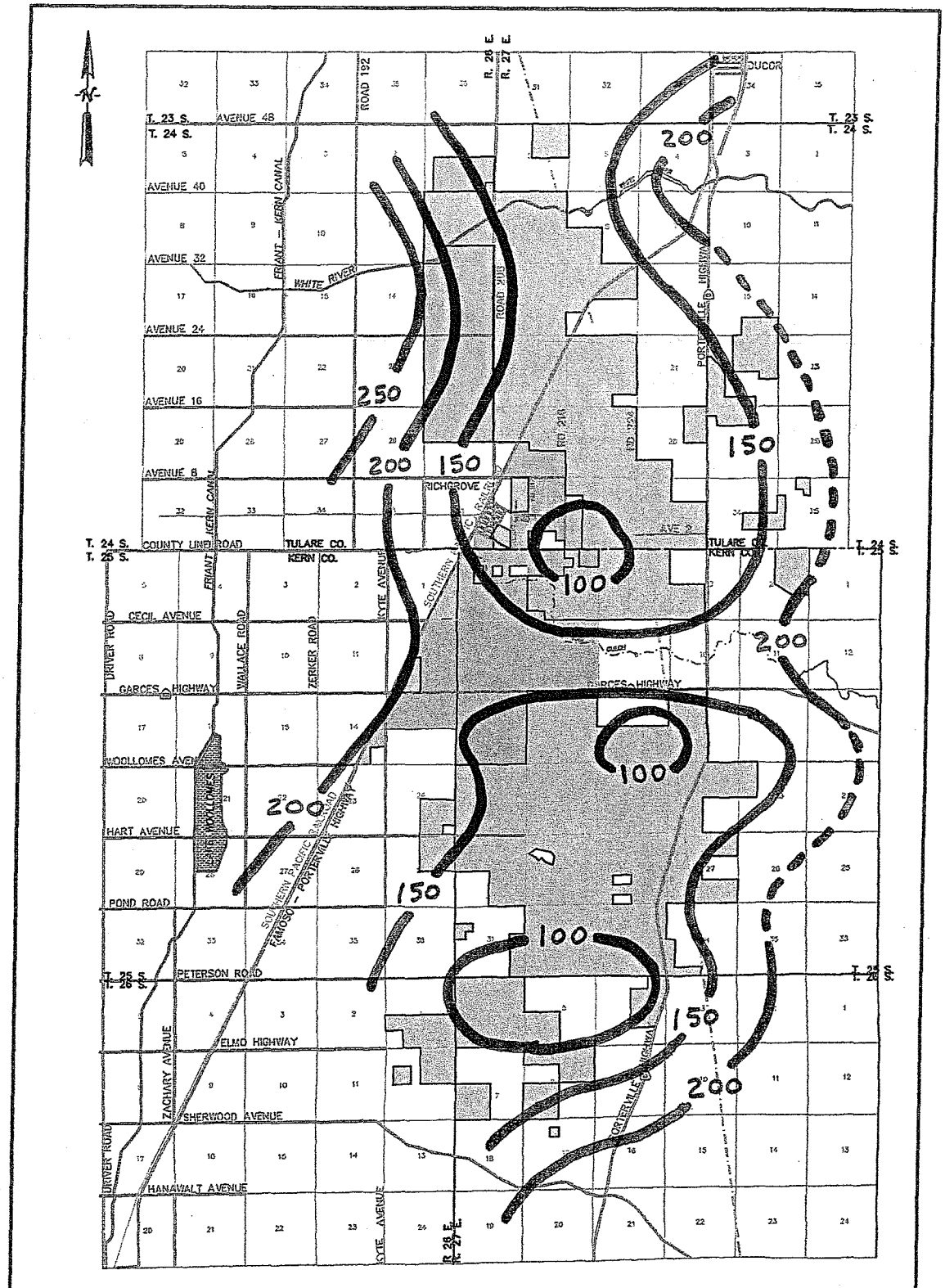

SPRING 2000
ELEVATION OF GROUNDWATER
LEGEND
KERN-TULARE WATER DISTRICT
RAG GULCH WATER DISTRICT
T. 23 S.
T. 24 S.
T. 25 S.
T. 26 S.
R. 26 E.
R. 27 E.
AVENUE 48
AVENUE 40
AVENUE 32
AVENUE 24
AVENUE 16
AVENUE 8
ROAD 192
ROAD 208
ROAD 216
ROAD 224
WHITE RIVER
FRIANT - KERN CANAL
COUNTY LINE ROAD
TULARE CO.
KERN CO.
RICHGROVE
DUCOR
PORTERVILLE HIGHWAY
CECIL AVENUE
DRIVER ROAD
WALLACE ROAD
ZERKER ROAD
KYTE AVENUE
SOUTHERN PACIFIC RAILROAD
GARCES HIGHWAY
WOODLOMES AVENUE
HART AVENUE
POND ROAD
PETERSON ROAD
ELMO HIGHWAY
ZACHARY AVENUE
SHERWOOD AVENUE
HANAWALT AVENUE
TAFT - WOODLOMES
TAFT - WOODLOMES ROAD
TAFT - WOODLOMES HIGHWAY
TIPTON - PORTERVILLE HIGHWAY
250
200
150
100
200
150
100
200
100
150
200

Figure 6

Sources of groundwater replenishment include underflow from foothill recharge areas, recharge from intermittent streams, and groundwater inflow from the west. The movement of groundwater has historically been westerly from the foothills toward the San Joaquin Valley. However, groundwater extraction in excess of groundwater recharge within the Districts has locally reversed this westerly gradient. In addition, Delano-Earlimart Irrigation District (DEID) and Southern San Joaquin Municipal Utility District (SSJMUD), located immediately to the west of the Districts, receive firm supplies of Central Valley Project (CVP) water, which has caused improved water levels beneath those districts.

GROUNDWATER QUALITY

Groundwater in the continental deposits contains between 250 and 400 parts per million (ppm) total dissolved solids and is of a calcium bicarbonate or sodium bicarbonate chemical type. The water is classified as suitable for irrigation.

Sedimentary rocks comprising the Santa Margarita and the Olcese formations are largely marine in origin and probably contained salty water when deposited. This water was subsequently flushed out due to recharge of fresh groundwater. A short distance west of Richgrove an interface between fresh and saline water is believed to exist in these formations which extends southeasterly through the Districts. Fresh groundwater found west of the interface is attributed to partial flushing by fresh water subsequent to the deposition of the aquifer. Water east of the interface is sodium chloride in character with total dissolved solids concentrations between 300 and 500 ppm and is classed as having medium to high salinity hazard and high to very high sodium hazard. Groundwater from the Santa Margarita and the Olcese Formations is high in hydrogen sulfide concentrations, which produces an objectionable odor. The danger in continued usage of this aquifer is that continued pumping can cause the salt water interface to migrate towards the east.

SUBSIDENCE

Subsidence of the land surface is caused by over-pumping of water from a confined aquifer system. As groundwater is extracted, storage that exists in pore space of the soil disappears and cannot be replaced. Over the period from 1962 through 1970, prior to when the Districts began importing significant amounts of surface water, subsidence in the Districts ranged from 0.5 to 1.5 feet. As a result of reduced groundwater pumping due to imported water supplies, it is the Districts understanding that subsidence has been eliminated.

WATER RESOURCES

CVP SUPPLIES

Kern-Tulare Water District has a contract with the Bureau of Reclamation for an annual supply of 40,000 acre-feet from the CVP. Rag Gulch Water District has a contract for an annual supply of 13,300 acre-feet. DWR conveys water under this contract through the California Aqueduct to Tupman. Water is then conveyed through the Cross Valley Canal, where it is either delivered to the Friant-Kern Canal or exchanged with Arvin-Edison Water Storage District (Arvin-Edison WSD) for water available in the Friant-Kern Canal.

The Districts contract annually for Section 215 Water. The Districts also purchase Class 1 and Class 2 Friant water supplies from Friant Contractors on an as-available basis. Occasionally, there are flood flows available from the Friant-Kern Canal, which the Districts also purchase.

KERN RIVER SUPPLIES

Kern-Tulare Water District has a contract with the City of Bakersfield for an average annual supply of 20,000 acre-feet of Kern River water. Rag Gulch Water District has a similar contract for an average annual supply of 3,000 acre-feet. Water under these contracts is delivered to Kern County Water Agency Improvement District No. 4 in exchange for State Water Project (SWP) water. The SWP water is conveyed through the Cross Valley Canal, where it is either delivered to the Friant-Kern Canal or exchanged with Arvin-Edison WSD for water available in the Friant-Kern Canal.

ARVIN-EDISON EXCHANGE

The Districts' CVP water supplies are available on the California Aqueduct or the Cross Valley Canal while the Districts are located east of the Friant-Kern Canal. This geographical difference caused the Districts to enter into a long-term exchange agreement with Arvin-Edison WSD. Under terms of this exchange, the Districts deliver all or a portion of their CVP supplies to Arvin-Edison WSD in the Cross Valley Canal and Arvin-Edison WSD makes water available to the Districts in the Friant-Kern Canal. However, there are years when there is not enough water available on the Friant system for exchange. In these years the Districts have the capability to deliver CVP water directly from the Cross Valley Canal into the Friant-Kern Canal.

OTHER BANKING AND EXCHANGE PROGRAMS

As a result of increasing federal and state regulatory actions in the delta, the Districts' CVP water supply reliability has been significantly reduced. If surface water supplies to the Districts are reduced, groundwater pumping will increase to meet the irrigation demands of water users. This reduction in the Districts CVP water supply has caused the Districts to pursue banking and exchange programs to compensate for the reduced supply. Below is a description of three such programs.

Kern County Water Agency Exchange

The Districts' CVP water is conveyed in the California Aqueduct under contract with DWR. Under this contractual agreement the Districts have a second priority (after DWR use) to pumping capacity at Banks Pumping Plant. This second priority causes uncertainty in some year with respect to being able to pump the Districts' CVP water south of the delta. As a result of these uncertainties, the Districts entered into an agreement with the Kern County Water Agency (Agency) to assist with regulation of this water supply. Under terms of the agreement, the Agency provides SWP water to the

Districts on an irrigation demand schedule and the Agency takes delivery of the Districts' CVP supply as capacity at Banks Pumping Plant is available.

North-Kern Water Storage District

The Districts have developed a groundwater banking program with North Kern Water Storage District (North Kern WSD) to deliver water to North Kern WSD for later withdrawal and use by the Districts. The project yields an estimated dry year supply of 5,000 acre-feet and improves local groundwater supplies to North Kern WSD. A 25-year agreement between the Districts and North Kern WSD was recently executed. The agreement requires the Districts to bank water before it can be extracted and leave 10% of the water banked in North Kern WSD to account for losses. Supplies available to the Districts for banking include the Districts' CVP contract supplies, Section 215 water, flood flows conveyed in the Friant-Kern Canal, purchases from Friant contractors, and Kern River water.

Rosedale-Rio Bravo Water Storage District

The Districts have also developed a groundwater banking program with the Rosedale-Rio Bravo Water Storage District (Rosedale-Rio Bravo WSD). The project consists of the Districts recharging water in Rosedale-Rio Bravo WSD when surface water supplies are available and extracting groundwater during years of inadequate surface water supplies. The project yields an estimated dry year supply of 9,000 acre-feet and improves local groundwater supplies to Rosedale-Rio Bravo WSD. A 25-year agreement between the Districts and Rosedale-Rio Bravo WSD was recently executed. The agreement requires the Districts to bank approximately two acre-feet for each acre-foot extracted and bank water before it can be extracted. Supplies available to the Districts for include the Districts' CVP contract supplies, Section 215 water, flood flows conveyed in the Friant-Kern Canal, purchases from Friant contractors, Kern River water, and SWP water.

FUTURE WATER SUPPLIES

The Districts have significant concerns with regard to future water supplies. Below is a description of three of these concerns.

1. As previously discussed, federal and state regulatory actions in delta have severely limited the ability of the Districts to receive their CVP water supplies.
2. The initial term of the contract with the City of Bakersfield ends on December 31, 2011. The ability of the Districts to receive a reliable supply of Kern River is uncertain beyond 2011.
3. A coalition of environmental groups has filed a lawsuit against the Federal government related to water supply contracts in the Friant Division of the CVP. The result of this lawsuit has the potential to substantially reduce the ability of the Districts to purchase Friant Class 1, Class 2, and Section 215 water supplies.

GROUNDWATER MANAGEMENT

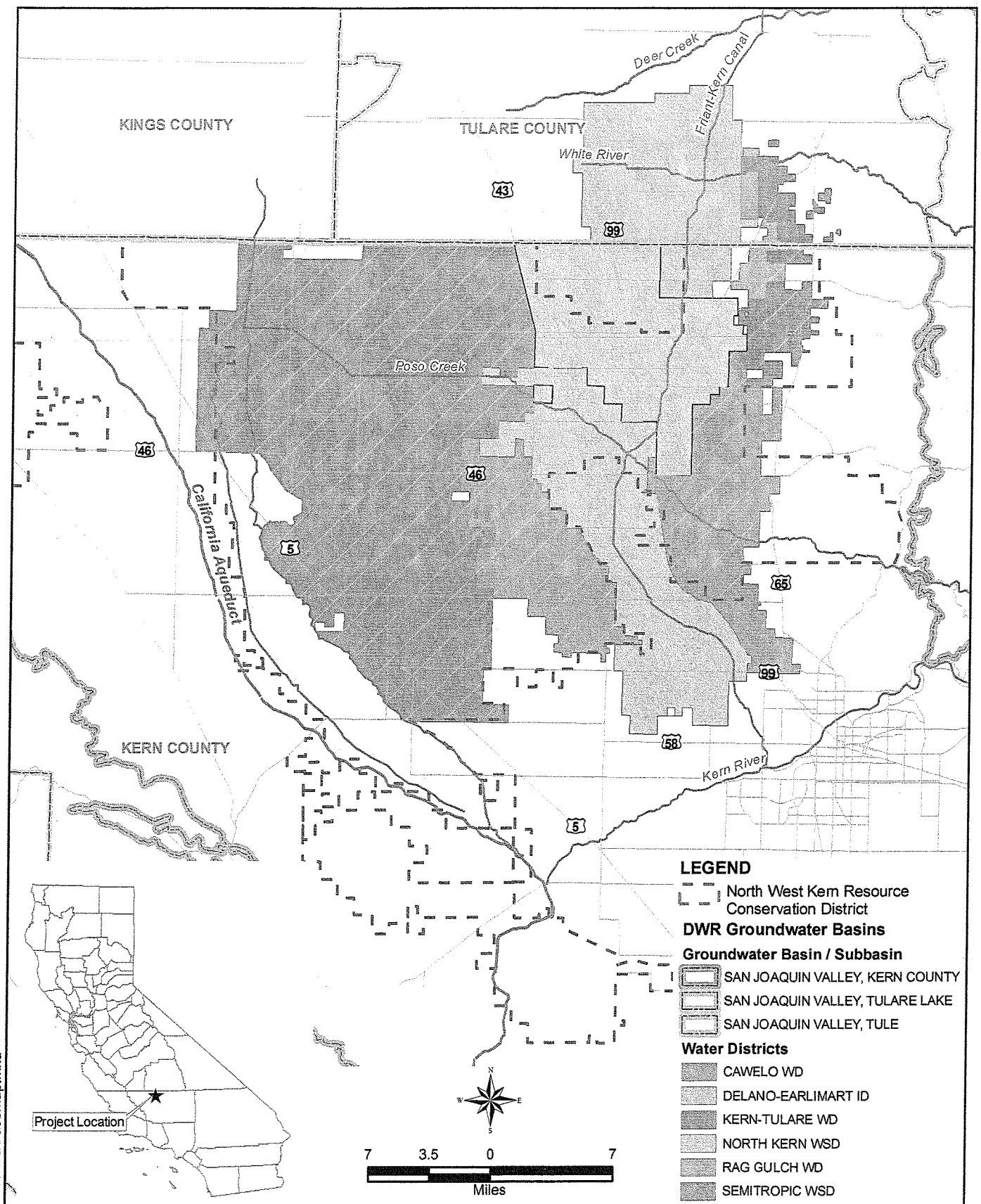
REGIONAL AGENCY INVOLVEMENT

Recently, the Districts, along with other districts in the region, formed the Poso Creek Regional Management Group. A map that details the area of the management group is presented in Figure 7. This regional management group was formed to enhance and refine the water management and planning activities currently under way in the region and will develop regional water management strategies and the framework for implementing them. Other members of the management group include:

- Semitropic Water Storage District
- Shafter-Wasco Irrigation District
- North Kern Water Storage District
- Cawelo Water District
- Delano-Earlimart Irrigation District
- North West Kern Resource Conservation District

The Districts are currently participating in a groundwater mediation process being led by the Agency. The mediation process involves the Agency, representatives from 17 water districts within the San Joaquin Valley portion of Kern County, the City of Bakersfield, and others. The purpose of this mediation is to agree upon rules for local management of the groundwater basin.

In 2001, the Districts participated along with eight other local water districts (Delano – Earlimart Irrigation District, Lower Tule River Irrigation District, Pixley Irrigation District, Porterville Irrigation District, Saucelito Irrigation District, Southern San Joaquin Municipal Utility District, Stone Corral Irrigation District, and Terra Bella Irrigation District) to prepare a report entitled: "Analysis of Groundwater Resources". The purpose of the investigation was to characterize the hydrologic conditions and identify favorable areas for recharge of surface water supplies that can be stored underground and later recovered.



Note: The area within the Conservation District, and outside the Water District areas, is not included in the IRWMP study area.

Semitropic Water Storage District Poso Creek IRWMP	Bookman-Edmonston A Division of GEI Consultants	MANAGEMENT GROUP DISTRICT BOUNDARIES
Kern County, California SOURCE: CA Spatial Library		APRIL 2006 Figure 7

05-10-06 S:/GIS/Projects/033740/Basemap.mxd

The Districts are members of the Friant Water Authority and the Friant Water Users Authority. As members of these authorities, the staff of the Districts attends several meetings a month to work cooperatively on water supply related issues, including groundwater management and surface water supplies.

The Districts are participants in the Cross Valley Canal, and as such, meet on a monthly basis with other local water districts and urban purveyors to work cooperatively on water conveyance and other related issues.

PUBLIC INVOLVEMENT

Public involvement for developing this Plan was initiated by publishing notices in the Visalia Times Delta and the Delano Record. Interested parties were invited to participate in development of the Plan by (1) requesting a copy of the draft plan, (2) submitting comments in writing, (3) attending a public hearing, and (4) attending regular monthly meetings of the Districts' boards of directors.

BASIN MANAGEMENT OBJECTIVES

The basin management objectives for the Districts are: (1) maintain or improve groundwater levels within the Districts, (2) control degradation of groundwater quality, and (3) limit land subsidence. These objectives can be accomplished as follows:

1. Pursue and support measures that will increase the yield and reliability of the Districts' CVP water supplies.
2. Work cooperatively with the City of Bakersfield and the Agency to acquire additional water supplies beyond 2011.
3. Continue to purchase Friant water supplies, Section 215 water, and other water available from the Friant-Kern Canal.
4. Continue to pursue water exchanges and banking programs with other water districts.

5. Develop groundwater recharge and/or banking programs within the Districts' boundaries.
6. Revise water pricing policies to encourage water users to maximize the use of surface water when it is available to save groundwater for future years.
7. Improve distribution facilities to maximize the delivery capability of surface water when it is available to save groundwater resources for future years.

MONITORING PLAN

The Districts' monitoring program provides data necessary for the Districts to evaluate changes in the local groundwater basin. The Districts' monitoring program consists of the following elements.

Groundwater levels

Groundwater levels are measured at approximately 100 wells throughout the Districts in the spring and the fall each year. These data are available from the Agency and from the DWR Web Site. Additionally, the Agency prepares an annual report that includes contours of groundwater levels.

Groundwater quality

Groundwater quality samples are occasionally taken in wells throughout the Districts. These data are available from the Agency and from the DWR Web Site. Additionally, the Agency prepares an annual report that identifies areas of water quality concern throughout the county. The most recent report does not indicate there are any areas of concern for the Districts.

Subsidence

Prior to the importation of surface water supplies, land surface subsidence was a significant concern. However, since surface water importation to the area began, the Districts are unaware of any issues related to subsidence. Therefore, the Districts have not found it necessary to monitor subsidence and have relied upon infrequent studies by state and federal agencies.

Changes in surface flow and surface water quality

The Districts are not aware of any changes in surface flow and surface water quality that directly affect the groundwater basin or are caused by groundwater pumping.

MONITORING PROTOCOLS

The Districts will periodically prepare a monitoring report to present the results of the monitoring program. The contents of the monitoring report could include:

- Maps showing groundwater elevations
- Water-level hydrographs
- Changes in water quality over time
- Assessment of effectiveness of basin management objectives and changes to those objectives

PLAN REVIEW

The Districts' Board of Directors will review the Plan every five years or sooner if needed.